

Advise Patients

Workers with flavoring-related lung disease should be removed from further exposure and relocated within the facility to areas where they will not be exposed to diacetyl or similar flavoring chemicals.

Remind patients of the importance of:

- Keeping flavoring containers tightly closed when not in use to prevent the contents from getting into the air.
- Reading and understanding labels on containers and material safety data sheets for substances that they are exposed to in the workplace.

Encourage patients to talk to their supervisors about:

- Training on hazard identification, procedures for safe handling of flavoring chemicals, and symptoms of flavoring-related lung disease.
- Exposure control methods (e.g., ventilation, isolation) and work practices (e.g., standard procedures for cleaning the workplace and for handling and storing flavoring chemicals).
- Wearing respirators (protective breathing equipment) and other personal protective equipment (e.g., gloves, eye goggles) to reduce exposures.



Use NIOSH-certified full-facepiece air-purifying respirators with at a minimum NIOSH-certified organic vapor cartridges and particulate cartridges/filters and other cartridges as necessary.

3. Report

Much remains to be learned about the nature of this serious lung disease. You can play an important role. With your assistance, the information gained from reporting can help identify high-risk work settings and guide efforts to prevent additional cases of flavoring-related lung disease.

Reporting of Cases

Please report any cases of occupational lung disease with or without fixed airways obstruction that you suspect are attributable to flavoring chemicals to your State Health Department and the NIOSH Division of Respiratory Disease Studies (Telephone: 1-800-232-2114).



Additional Information

To learn more about the effects of flavorings:

NIOSH Web site:
www.cdc.gov/niosh/topics/flavorings

NIOSH [2003]. NIOSH Alert: Preventing Lung Disease in Workers Who Use or Make Flavorings [<http://www.cdc.gov/niosh/docs/2004-110>].

NIOSH

Telephone: 1-800-CDC-INFO (1-800-232-4636)
TTY: 1-888-232-6348 | E-mail: cdcinfo@cdc.gov

or visit the NIOSH Web site at www.cdc.gov/niosh

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DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

✓ Recognize ✓ Respond ✓ Report



Flavoring-Related Lung Disease

Information for Healthcare Providers

Workers who breathe flavoring chemicals containing diacetyl, such as butter flavoring, may be at risk of severe obstructive lung disease.

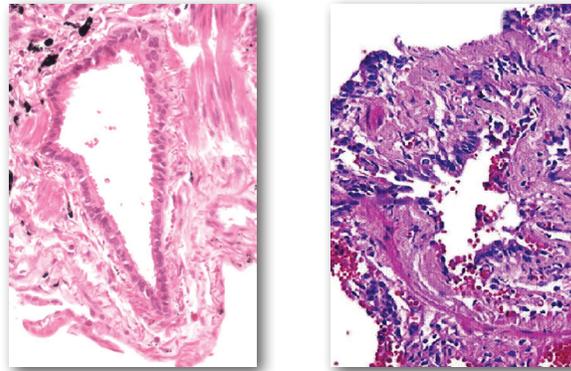




1. Recognize

Take an Occupational History

Before arriving at a final diagnosis, take an occupational history from patients whose symptoms might be due to asthma, chronic bronchitis, emphysema, pneumonia, or smoking. Affected workers may have worked with flavoring chemicals for a few months to a few years. Ask your patients about jobs held, exposure to flavoring chemicals (and other dusts, mists, gases, vapors, or fumes), and if other coworkers have experienced similar symptoms.



Healthy bronchiole (left) and bronchiole of an affected worker (right) showing patterns of constrictive bronchiolitis obliterans.

What is the problem/illness?

Severe obstructive lung disease has been identified in people who work with flavoring chemicals containing diacetyl, including butter flavoring. Cases of severe lung disease have occurred in microwave popcorn plants and flavoring production plants. Lung biopsies in some affected people have shown the presence of a rare condition; constrictive bronchiolitis obliterans (also referred to as constrictive bronchiolitis, obliterative bronchiolitis, and bronchiolitis obliterans). In some workers, fixed airways obstruction has been severe enough to be fatal.

Who is at risk?

Workers who make, use, or work near flavoring chemicals containing diacetyl may be at risk. Settings where these exposures may occur include:

- Flavoring plants
- Microwave popcorn plants
- Commercial and retail bakeries
- Snack food and candy plants
- Dairy products and packaged vegetable oil plants (e.g., margarine, cooking oil)
- Other flavored food production plants

While exposures in the flavoring industry and in microwave popcorn production have caused severe lung disease in some workers, the degree of risk to workers from exposures in other work settings is currently unknown.

2. Respond

Conduct a Medical Evaluation

Medical testing may include the following:

- **Spirometry** most often shows an obstructive pattern of ventilatory impairment that does not improve after bronchodilators and sometimes shows a restrictive pattern of ventilatory impairment. Careful comparison of spirometry test results over time is important to identify potentially concerning declines in lung function.
- **Lung volume assessments** are consistent with hyperinflation.
- **Carbon monoxide diffusing capacity measurement** is generally normal, especially early in the disease.
- **Chest x-rays** are usually normal but may show hyperinflation.
- **High-resolution computerized tomography scans** of the chest at full inspiration and expiration often reveal heterogeneous air trapping on the expiratory view and may demonstrate mosaic attenuation, bronchial wall thickening, cylindrical bronchiectasis, and/or scattered ground glass opacities.
- **Lung biopsies** are not generally required for diagnosis, but may reveal evidence of constrictive bronchiolitis obliterans. Sometimes the term clinical bronchiolitis obliterans is used for patients who have medical test findings consistent with the disease constrictive bronchiolitis obliterans but do not have confirmatory biopsy results.

Perform Medical Management

Patients with flavoring-related lung disease should be removed from further exposure to diacetyl or similar flavoring chemicals. Removal from exposure does not usually result in significant improvement, but the level of impairment often stabilizes. No specific treatment has been shown to reverse abnormalities in lung function. Symptomatic therapy should be provided as appropriate.

Ask About Symptoms

Symptoms are not present in all cases. When present, symptoms can range in severity. The main respiratory symptoms experienced by workers include:

- Cough (usually without phlegm)
- Shortness of breath on exertion
- Wheezing

Other symptoms experienced by some workers include:

- Fever, night sweats, or weight loss
- Frequent or persistent eye, nose, throat, or skin irritation

In cases of flavoring-related lung disease, respiratory symptoms do not typically improve when the worker goes home at the end of the workday, on weekends, or on vacations. The symptoms often have a gradual onset but can occur suddenly. Work-related exposure to butter flavoring chemicals might also lead to asthma or exacerbate pre-existing asthma.